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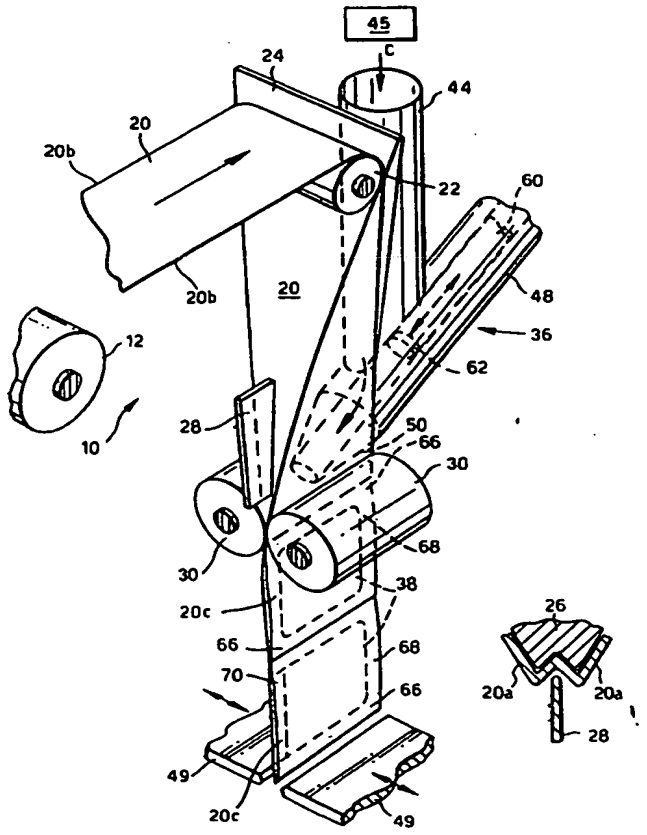
(57) **Abstract**

Apparatus for manufacturing a DOY bag includes flow formers (24, 28) for causing a moving web (20) to have a transverse cross section which comprises two arms (20a) each having a free end coinciding with a respective lengthwise extending edge (20b) of the web and a portion interconnecting the arms which extends inwardly into the space between the arms. Heated sealing rollers (30) disposed downstream of the flow formers seal the web to form successive closed compartments (38). A device (36) feeds a flowable material into the space between the arms (20a) at a position upstream of the sealing rollers (30) such that each compartment (38) contains a predetermined amount of the flowable material. The apparatus preferably operates continuously producing between 300 and 1000 bags per minute.



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Packaging

The invention relates to the packaging of flowable materials and particularly, but not exclusively, to packaging tea or coffee in small porous bags which permit brewing of their content whilst in the bag.

A known form of packaging for flowable materials is the so-called DOY bag. DOY bags are typically made of a plastics material and are produced in relatively large sizes to contain flowable materials such as soups, washing-up liquids and powders or pet foods.

Conventionally, DOY bags are made by running a heat sealable plastics web in a horizontal direction over a former and through heated sealing rolls to produce a bag-like container which has a generally W-section at its lower end and is open at the top. Portions of the lower end of the bag are sealed to increase the stiffness of the bag in this region whilst retaining the W-section, so forming a base on which the bag can stand. The bag is filled from above and its top is then sealed prior to separation from the web. This process is intermittent rather than continuous and a typical production speed would be 100 bags per minute.

The invention provides apparatus for use in manufacturing packaging containing a flowable material, said apparatus comprising flow forming means for causing a moving web to have a transverse cross-section which comprises two arms and a portion interconnecting said arms which portion extends inwardly into a space defined between said arms, sealing means disposed downstream of said forming means for sealing said web to define successive closed compartments and means for feeding a flowable material into said space between said arms at a position upstream of said sealing means such that each said compartment contains a predetermined amount of said flowable material.

The invention also includes a method of manufacturing packaging containing a flowable material comprising the steps of:

(i) causing a moving web to have a transverse cross-section which comprises two arms and a portion interconnecting said arms which portion extends

inwardly into a space defined between said arms;

(ii) forming a first seal and subsequently a second seal, said seals being spaced apart in the lengthwise direction of said web and each extending across said web in a lengthwise direction of said arms;

(iii) forming a third seal extending between said first seal and said second seal in said lengthwise direction of the web in the region of said lengthwise extending edges so as to define a closed compartment; and

(iv) feeding a predetermined amount of a flowable material into said space between said arms prior to forming said second seal and at least prior to completion of said third seal such that said material will be contained in said compartment.

The invention also includes apparatus for use in manufacturing packaging containing a flowable material, said apparatus comprising forming means for causing a moving web to have a transverse cross-section which comprises two arms and a portion interconnecting said arms which portion extends into a space defined between said arms, means for feeding a flowable material into said space between said arms and sealing means for sealing said web so as to define successive compartments each containing a predetermined amount of said flowable material, the arrangement being such that said web moves downwardly past said forming means, feeding means and sealing means.

The invention also includes a method of manufacturing packaging containing a flowable material comprising the steps of:

(i) causing a web to move in a downwards direction;

(ii) causing said downwardly moving web to have a transverse cross-section which comprises two arms and a portion interconnecting said arms which portion extends inwardly into a space defined between said arms;

(iii) feeding a flowable material into said space; and

(iv) sealing said web so as to define successive compartments each containing a predetermined amount of said flowable material.

Certain materials which are flowable do not flow readily.

One such material is roast and ground coffee which does not flow as nearly readily as, for example, tea. In order to fill a bag-like container with ground coffee it is desirable to provide a dosing system which pumps the coffee into the container; this is particularly the case if processing speeds in excess of 100 bags per minute are to be achieved.

The invention also includes a device for feeding a predetermined amount of flowable material into a container, said device comprising inlet means for receiving said flowable material, means defining at least one dosing chamber, means for driving said flowable material from said inlet means to the or each said dosing chamber, and reciprocating means movable through the or each said dosing chamber to drive a predetermined amount of said flowable material into said container.

The invention also includes a device for feeding a predetermined amount of flowable material into a container, said device comprising means defining at least one outlet, means defining a plurality of dosing chambers, inlet means for receiving said flowable material, means for driving said flowable material from said inlet means to said dosing chambers, means for pushing said flowable material out of said dosing chambers to said outlet defining means and means for causing relative reciprocal movement between said outlet defining means and said chamber defining means, the arrangement being such that each said chamber can be positioned in alignment with said pushing means and said outlet means whilst the or at least one other chamber receives flowable material from said inlet means.

In order that the invention may be well understood, some embodiments thereof, which are given by way of example only, will now be described with reference to the drawings, in which:

Figure 1 is a schematic perspective view of an apparatus for use in manufacturing packaging containing a flowable material;

Figure 2 is a scrap section showing the formation of a W-section in a web by means of the apparatus of Figure 1;

Figure 3 is an elevational view of a heated sealing roller of the apparatus shown in Figure 1;

Figure 4 is a schematic representation of a feeding device of the apparatus of Figure 1;

Figure 4a shows a modification to the feeding device of Figure 4;

Figure 5 shows the closed end of a W-section web containing a dose of flowable material prior to sealing of the lengthwise extending edges of the web;

Figure 6 shows the W-section web after sealing of its closed end;

Figure 7 is a perspective view showing alternative heated sealing rollers;

Figure 8 shows an alternative feeding device; and

Figure 9 shows yet another alternative feeding device.

An apparatus 10 for use in the manufacture of packaging containing a flowable material is illustrated by Figures 1 to 4. In the description which follows, the apparatus 10 will be described in connection with the manufacture of coffee bags made of a porous material so as to be suitable for infusion in a mug or like container. However, it is to be understood that the apparatus is equally applicable to the manufacture of tea bags or much larger bags made of a non-porous material, such as a heat sealable plastics material, suitable for storing flowable materials such as rice or snack foods such as crisps.

The apparatus 10 comprises means 12 for mounting a roll of a porous heat sealable web 20. The mounting means comprises a roller 12 on which the web 20 is rotatably supported. Heat sealable webs suitable for the manufacture of tea or coffee bags are well known to those skilled in the art.

The web 20 is fed from the mounting means to an idler roller 22. It will be appreciated tensioning rollers may be provided between the roller 12 and idler roller 22 should this prove desirable. The web is disposed generally horizontally on reaching the roller 22 and is turned through 90 degrees so as to run substantially vertically downwards into a forming area in which it is caused to have a transverse cross-section which comprises two outer arms 20a each having a free end coinciding with a respective lengthwise extending edge 20b of the web, and an inverted generally V-shaped portion interconnecting the arms such that the closed end of the transverse cross-section is generally W-shaped: the closed end of the section is shown in Figures 2 and 5. For

ease of reference, in the description which follows the above-described transverse cross-section will be referred to as the W-section.

In more detail, the idler roller 22 guides the web 20 onto the wider end of a substantially triangular flow former plate 24. The former plate defines, or may have fixed to it, a W-section rib 26 which extends over a relatively short distance in the lengthwise direction of the plate. A generally rectangular former plate 28 is positioned such that a lengthwise extending edge thereof extends both parallel to and substantially in the plane of the axis of the rib 26. As indicated in Figures 1 and 2, the web passes over the plate 24 and then between the plate 28 and rib 26. The arrangement is such that as the initially flat web moves through the forming area, the edges 20b are brought into a generally opposed spaced apart relationship gradually defining and increasing the length of the arms 20a and towards the end of the forming process an inward tuck (i.e. into the space between the arms) is provided at the point at which the arms 20a join, thereby defining a W-section web.

Two heated sealing rollers 30 are positioned downstream of the former plates 24, 28. The sealing rollers 30 are disposed in opposed spaced apart relationship and in addition to heat sealing the web to form compartments 38 for the coffee, they also serve to draw the web over the idler roller 22 in a continuous manner. Of course, other drive rollers could be provided to perform this web drawing function in addition to, or instead of, the sealing rollers 30.

The apparatus 10 additionally comprises a device 36 for feeding predetermined amounts of coffee to a required position between the outer arms 20a of the W-section web. In the manufacture of bags containing coffee, the device 36 is required to deliver 4 to 6 grams of coffee per bag whereas for the production of tea bags a delivery rate of 2 to 4 grams of tea is required.

The device 36, which is described in more detail hereinbelow, intermittently feeds predetermined amounts of coffee between the outer arms 20a of the web at a position downstream of the lowermost end of the rib 26 and immediately upstream of the

sealing rollers 30.

The sealing rollers 30 seal the web to form successive compartments 38 each of which contains a dose of coffee. As shown in Figure 3, at each end, the sealing rollers have a circumferentially extending rib 40, 42. The ribs 40, 42 are interconnected by transverse ribs 46 which extend parallel to the axis of the roller. The rollers have four such transverse ribs so that they can make four transverse seals per revolution. It will be appreciated that the ribs 40, 42, 46 define recesses 47 which in turn define the outline of the compartments 38. The trailing edge of each transverse rib 46 is relieved at 48 to provide a shock absorbing facility during filling of the compartment 38: this is described in more detail hereinbelow.

Severing means in the form of two reciprocating blades 49 are provided downstream of the sealing rollers 30. The blades 49 are arranged to cut through the seals made by the transverse ribs 46 to separate the compartments from the web and thereby provide discrete bags each containing a dose of coffee. It will be appreciated that other forms of severing means may be provided. For example, instead of reciprocating blades, rollers carrying blades may be provided or the heated sealing rollers may carry cutting means. Alternatively, non-contact cutting means such as ultrasound, laser or heat cutters might be used.

The feeding device 36, which is shown in detail in Figure 4, comprises an inlet tube 44 which extends in a direction generally parallel to the downwardly moving web 20. The tube 44 defines a flow path for coffee C which is received from a primary source 45 (Figure 1). The primary source does not form a part of the invention and since such devices will be familiar to those skilled in the art will not be described in any detail herein.

At its downstream end the inlet tube 44 feeds into a second tube 48. The tube 48 has its axis inclined with respect to the axis of the inlet tube. A tapering nozzle 50 is provided at the downstream end of the second tube 48. Immediately upstream of the nozzle 50, the second tube defines a chamber 52 which receives coffee from the inlet tube. An auger 56 is provided in the inlet tube 44 to pump the coffee into the chamber 52. It will be appreciated that an auger may not be required when the apparatus

is to be used to package materials which flow more readily than coffee.

The feeding device 36 has a reciprocating plunger 60 positioned in the second tube 48 and arranged to be driven through the chamber 52 so as to push a wad of coffee through the nozzle 50 into the space between the arms 20a of the W-section web. In Figure 4, dashed lines are used to indicate the position of the plunger at the end of a pushing stroke in which the plunger head 62 is disposed at the downstream end of the nozzle having pushed a wad of coffee between the arms 20a of the web. It will be appreciated that by suitable control of the pumping action of the auger 56 and the movement of the plunger 60, wads of coffee representing a required dose of coffee can be injected between the arms 20a of the web at the required rate to ensure that each compartment 38 contains a predetermined amount of coffee. In this connection, it should be noted that the auger may be run at a constant speed or where additional control of the dose size is required may be driven at variable speeds under the control of, for example, a servo motor. In a preferred embodiment the coffee injected between the arms 20a is accelerated at about 60g where 1g has a value of $9.80665 m/s^2$.

The arrangement shown in Figure 4 may be modified as shown in Figure 4a in order to provide further control of the product ejected from the dosing chamber 52. The device shown in Figure 4a is essentially the same as that shown in Figure 4 and like parts have therefore been given a common reference numeral. The Figure 4a device additionally comprises a sleeve 63 which is housed coaxially in the tube 48. The plunger 60 is slidable in the sleeve which in turn is slidable in the same direction as the sleeve. There is a gap 64 between one end of the sleeve 63 and the nozzle 50. The size of this gap can be altered by the aforementioned sliding movement of the sleeve which is indicated by arrow 65. Suitable means (not shown) can be provided for causing the sleeve to slide and for locking the sleeve in a desired position. By controlling the size of the gap 64 the amount of product dispensed on each downward stroke of the plunger can be controlled. As a further alternative, the sleeve may extend into the nozzle 50 such that there is no gap 64. In this case, one or more through-holes

(not shown) are provided in the sleeve wall. The sleeve arrangement would be such that movement of the sleeve varied the extent to which the through-hole(s) would be covered by the nozzle to facilitate control of dose size.

In use, the web 20 is drawn continuously over the idler roller 22 by the sealing rollers 30 and passes downwardly over the former plate 24 and between the rib 26 and plate 28. At this point the web has been formed into a W-section and a dose of coffee is injected between the outer arms 20a of the W-section web. As the web passes through the nip of the rollers 30, the open end of the W-section is pinched, bringing the free ends of the outer arms 20a together and, at regular intervals which are determined by the speed of rotation of the rollers, seals 66 which extend across the web are formed. As viewed in the drawing, the seals 66 each define the uppermost side of one compartment 38 and the lowermost side of the adjacent upstream compartment. The circumferential ribs 40, 42 of the rollers seal the web at the respective lengthwise extending edges of the web. The seal 68 formed by the rib 42 serves to seal the end of the compartments 38 which is formed by pinching together the open end of the W-section web and the seals 70 formed by the rib 40 stiffen the opposite end of the compartments such that, once severed from the web, each bag can stand on that end: the latter feature is described in more detail below.

As mentioned above, each transverse rib 46 has its trailing edge 48 relieved. The effect of this is that subsequent to the formation of a seal 66 by a pair of opposed ribs 46, the relieved portions 48 of the ribs maintain the two sides of the web adjacent the seal in relatively close proximity for a short period of time sufficient to allow injection of a dose of coffee. This provides a degree of shock absorption by preventing injection of the coffee directly onto the seal 66.

Thus, each compartment 38 is successively defined and filled with a dose of coffee in a continuous process. The process commences with the sealing of the uppermost side (as viewed in the drawing) of the preceding compartment and is followed by the injection of the dose of coffee, the sealing of the right-hand side (as viewed in the drawing) of the compartment and finally with the sealing of the uppermost side. It will be appreciated

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that coffee injection occurs when only two sides of respective compartments have been defined and the remaining two sides have not been formed.

It will be understood that for the purposes of defining a compartment 38, the formation of the seals 70 at the closed end of the W-section is not required. As indicated above, those seals are formed to stiffen that edge of the compartment. Referring to Figures 5 and 6 which show the closed end of the W-section web before and after sealing, it will be seen that the effect of the sealing operation is to seal the ends of the outer arms 20a which are at the inner end of the W-section to opposing portions of the respective inner arms 20c of the W-section. The effect of this operation is to form a leg 20d (Figure 6) along each side of the bag. The legs 20d are sufficiently stiff and arranged such that the bag can stand on them and also provide the compartment with a depth d (Figure 6) . One benefit of the space this provides is that the coffee contained in the compartments 38 has some freedom to move during infusion which improves the brewing process. It will be appreciated that the depth of the compartment decreases towards the seal 68. For the avoidance of any doubt, the arms 20a are shown truncated in Figures 5 and 6 so that only the closed end of the W-section web is illustrated in those Figures.

Those skilled in the art will be aware that heat sealable porous materials suitable for manufacturing coffee or tea bags can be readily obtained. Such materials typically come in the form of a web which on one side has a heat curable adhesive which may, for example, comprise polypropylene fibres. A heat curable adhesive is indicated at 20e in Figure 5. Thus, whilst the heated sealing rollers can cause the inner sides (as viewed in Figure 5) of the respective pairs of arms 20a, 20c to adhere to one another, the outer surfaces of the inner arms 20c should not and therefore the W-section can be maintained after sealing.

An alternative form of sealing roller for sealing the web is shown in Figure 7. The sealing rollers 130 each have a plurality of ribs disposed on the roller surface 132. There are two ribs 140, 142 extending circumferentially about the roller surface 132 and four ribs 146 extending parallel to the roller axis. The ribs 146 extend between the circumferential ribs 140, 142. Additional

ribs 148, one on each side of each transverse rib 146, extend between the transverse ribs and the circumferential rib 140. The ribs 140, 142, 146, 148 define hollows 149 which define the outline of the coffee containing compartments formed by the sealing rollers 130. Although not shown, it is preferable that the trailing edges of the ribs 146 are relieved in the same way as the transverse ribs 46 of the sealing rollers 30.

The circumferential rib 140 serves to seal in the region of the closed end of the W-section and the inclined ribs 148 increase the area of sealing in that region thereby increasing the overall stiffness of the base region of the coffee bag. This also increases the ability of the bag to define a compartment which has depth.

Figure 8 shows an alternative feeding device 150 for feeding flowable material between the outer arms 20a of the W-section web. The device 150 comprises a tube 152 with a nozzle 154 at its downstream end. A servo-driven auger 156 is housed in the tube 148 and extends into the nozzle 154. The auger is driven intermittently to pump doses of coffee into the W-section web. By means of the servo drive, the amount of coffee pumped by the auger can be regulated to ensure that the required dosage of coffee is achieved. It will be appreciated that the sleeve arrangement described with reference to Figure 4a may also be used with the feeding device 150.

Figure 9 shows yet another alternative feeding device 236. The device 236 has two inlet feed tubes 248 which are disposed in parallel spaced apart relationship and a fixed plate 249 which has a centrally located through-hole in which a nozzle 250 is located.

A sliding plate 252 is arranged between the inlet tubes 248 and the fixed plate 249. The sliding plate defines two through-holes 254.

A reciprocal plunger 260 is disposed between the inlet tubes 248 in alignment with the nozzle 250.

The arrangement of the device 236 is such that in a first position (as shown) one of the through-holes 254 is in alignment with its feed tube 248 whilst the other is aligned with the nozzle 250 and plunger 260. In combination with the fixed plate 240, the through-hole 254 in alignment with the feed tube 248 defines a

circular dosing chamber which is fed with coffee from the aligned feed tube. An auger (not shown), or other form of device capable of pushing the coffee along the feed tube is provided to push coffee from the feed tube into the dosing chamber defined by the through-hole 254 and fixed plate 249.

The through-hole 254 aligned with the nozzle 250 carries a dose of coffee received from its inlet tube 248 and defines with the nozzle a continuous through-passage into which the plunger is driven. When the plunger is driven through the through-hole into the nozzle, the dose of coffee is displaced into the space between the outer arms 20a of the W-shaped web.

It will be appreciated that by causing the plate 252 to move back and forth, one through-hole 254 can be filled with coffee from its inlet tube 248 whilst a dose of coffee contained in the other through-hole is pushed through the nozzle by the plunger 260.

The augers or other devices used to push coffee from the inlet tubes 248 into the respective through-holes can be regulated to control the density of the dose of coffee contained in the dosing chambers and to prevent bridging.

It will be understood that whilst in the embodiment the movement of the plate 252 is translational, subject to a suitable arrangement of the tubes 248, nozzle 250, through-holes 254 and plunger 260 on a common radius, the plate could have a reciprocal rotational movement.

It will be appreciated that if the device 236 is to be used to feed materials which flow more readily than ground coffee, it may be possible to rely on gravity feed to the dosing chambers and dispense with pushing devices in the inlet tubes.

The feed devices 36 and 236 whilst more complex than the device 150 provide advantages in terms of their greater operating speeds. With a servo-driven auger as shown in Figure 8, the speed of operation is limited by the rate at which the auger can be accelerated and decelerated each time it is operated to inject a dose of coffee. In the case of the devices 36 and 236 the auger, or such pushing devices as may be used with the device 236, can be in constant operation and the speed of operation is limited by the speed of the reciprocating parts. It is anticipated that the

apparatus 10 will be capable of producing between three hundred and one thousand bags per minute and that the feed devices 36 and 236 will be required for operating at the upper end of that range. It will be appreciated that whilst the embodiments have been described in connection with a heat sealable material, it would be possible for the bags to be made of other materials with an adhesive being applied upstream of the sealing rollers.

It will be understood that although the sealing rollers shown in Figures 3 and 7 have four transverse ribs, the number of ribs per roller may be different. For example, for the purposes of producing large bags, each roller may have only one transverse rib.

The sealing rollers may be provided with resilient inserts made of, for example, silicone rubber in order to aid the sealing process where it is desired to provide an airtight seal. As an alternative and to provide the same effect, the ribs of the sealing roller may resiliently biassed outwardly of the roller surface.

It will be appreciated that instead of a triangular flow former plate, a circular or oval former plate may be used and that instead of a fixed former plate a rotatably mounted disc could be used with the circumferentially extending edge of the disc being substantially in the plane of the longitudinal axis of the W-section web 26.

It will be appreciated that in its broadest aspect, the invention provides an apparatus and method for continuously manufacturing DOY bags in which the bags are formed by operations on a downwardly moving web. It will also be appreciated that the invention provides an apparatus and method for producing a DOY bag in which the flowable material to be contained in the bag is injected from the side rather than from above the web and before the compartments which contain the material have been formed.

It will also be appreciated that the invention provides an apparatus and a method of manufacturing a DOY bag which may be continuous rather than intermittent.

It will be appreciated that the embodiment provides an integral sealing station at which all of the bag seals (which extend in three different directions) are formed between two

sealing members.

Although, it is anticipated the apparatus will capable of producing up to one thousand bags per minute, it is believed that a preferable speed range will be between 300 and 700 bags per minute.

Preferably, the device extends generally parallel to the web 20 and injects material into the space between the arms 20a at an angle in the region of 10° to the vertical. The angle of injection may be between 5° and 30° to the vertical.

CLAIMS

1. Apparatus for use in manufacturing packaging containing a flowable material, said apparatus comprising flow forming means for causing a moving web to have a transverse cross-section which comprises two arms and a portion interconnecting said arms which portion extends inwardly into a space defined between said arms, sealing means disposed downstream of said forming means for sealing said web to define successive closed compartments and means for feeding a flowable material into said space between said arms at a position upstream of said sealing means such that each said compartment contains a predetermined amount of said flowable material.

2. Apparatus as claimed in claim 1, wherein said forming means causes said inwardly extending portion to be substantially V-shaped such that a closed end of said transverse cross-section is substantially W-shaped.

3. Apparatus as claimed in claim 1 or 2, wherein said flow forming means comprises a generally triangular flow forming plate.

4. Apparatus as claimed in claim 3 when dependent on claim 2, wherein said forming plate carries or defines a W-section rib means which defines a substantially W-section rib and said forming means further comprises means defining an edge aligned with the lengthwise axis of said W-section rib and arranged such that said web passes between said rib and said edge.

5. Apparatus as claimed in any one of claims 1 to 4, wherein said web is caused to move continuously.

6. Apparatus as claimed in any one of the preceding claims, wherein said web is caused to move by said sealing means.

7. Apparatus as claimed in any one of the preceding claims, wherein said sealing means comprises two heated rollers

disposed in opposed spaced apart relationship.

8. Apparatus as claimed in any one of the preceding claims, wherein said web is caused to move downwardly past said forming means and said feeding means.

9. Apparatus as claimed in any one of the preceding claims, wherein said flowable material is fed between said arms in a direction transverse to said direction of movement of the web.

10. Apparatus as claimed in any one of the preceding claims, comprising severing means for severing said compartments from said web to form discrete bags each comprising a said compartment.

11. A method of manufacturing packaging containing a flowable material comprising the steps of:

(i) causing a moving web to have a transverse cross-section which comprises two arms and a portion interconnecting said arms which portion extends inwardly into a space defined between said arms;

(ii) forming a first seal and subsequently a second seal, said seals being spaced apart in the lengthwise direction of said web and each extending across said web in a lengthwise direction of said arms;

(iii) forming a third seal extending between said first seal and said second seal in said lengthwise direction of the web in the region of said lengthwise extending edges so as to define a closed compartment; and

(iv) feeding a predetermined amount of a flowable material into said space between said arms prior to forming said second seal and at least prior to completion of said third seal such that said material will be contained in said compartment.

12. A method as claimed in claim 11, wherein said web is fed downwardly during said forming, feeding and sealing steps.

13. A method as claimed in claim 11 or 12, comprising the step of forming respective fourth seals between respective inner surfaces of said arms and said interconnecting portion which seals are extended between said first seal and said second seal and in the lengthwise direction of the web.

14. A method as claimed in claim 13, wherein said fourth seals and said third seal are formed simultaneously.

15. A method as claimed in any one of claims 11 to 14, wherein said interconnecting portion is caused to be substantially V-shaped such that a closed end of said transverse cross-section is generally W-shaped.

16. A method as claimed in any one of claims 11 to 15, wherein said web is caused to move continuously so as to define successive compartments each containing a predetermined amount of said material.

17. A method as claimed in claim 16, comprising forming more than one hundred compartments per minute.

18. A method as claimed in claim 17, comprising forming three hundred to seven hundred compartments per minute.

19. A method as claimed in any one of claims 11 to 18, wherein said web consists of a porous material for permitting infusion.

20. A method as claimed in claim 19, wherein said flowable material is tea or coffee.

21. A method as claimed in any one of claims 11 to 20, comprising the step of severing said compartments from said web to

form discrete bags containing said flowable material.

22. A method as claimed in any one of claims 11 to 21, wherein said flowable material is fed between said opposed arms in a direction transverse to the lengthwise direction of said web.

23. Apparatus for use in manufacturing packaging containing a flowable material, said apparatus comprising forming means for causing a moving web to have a transverse cross-section which comprises two arms and a portion interconnecting said arms which portion extends into a space defined between said arms, means for feeding a flowable material into said space between said arms and sealing means for sealing said web so as to define successive compartments each containing a predetermined amount of said flowable material, the arrangement being such that said web moves downwardly past said forming means, feeding means and sealing means.

24. Apparatus as claimed in claim 23, wherein said downwards movement is substantially vertically downwards.

25. Apparatus as claimed in claim 23 or 24, wherein said feeding means is arranged to feed said flowable material in a direction transverse to said downward movement.

26. Apparatus as claimed in claim 23, 24 or 25, wherein said downwards movement is caused by said sealing means.

27. Apparatus as claimed in any one of claims 23 to 26, wherein said sealing means comprises two heated rollers disposed in opposed spaced apart relationship.

28. Apparatus as claimed in any one of claims 23 to 27, comprising severing means for severing said compartments from said web to form discrete bags each comprising a said compartment.

29. Apparatus as claimed in any one of claims 23 to 28, wherein said flowing means comprises a generally triangular flow

forming plate.

30. Apparatus as claimed in claim 29, wherein said forming plate defines a W-section rib or carries means defining a substantially W-section rib and said forming means further comprises means defining an edge aligned with the lengthwise axis of said W-section rib and arranged such that said web passes between said rib and said edge.

31. A method of manufacturing packaging containing a flowable material comprising the steps of:

(i) causing a web to move in a downwards direction;

(ii) causing said downwardly moving web to have a transverse cross-section which comprises two arms and a portion interconnecting said arms which portion extends inwardly into a space defined between said arms;

(iii) feeding a flowable material into said space; and

(iv) sealing said web so as to define successive compartments each containing a predetermined amount of said flowable material.

32. A method as claimed in claim 31, wherein said flowable material is fed between said arms in a direction transverse to said downwards direction.

33. A method as claimed in claim 31 or 32, wherein said step of sealing said web includes simultaneously forming (i) respective seals between respective inner surfaces of said arms and said interconnecting portion and (ii) a seal in the region of said lengthwise extending edges, each of said seals extending continuously in the lengthwise direction of said web.

34. A method as claimed in claim 31, 32 or 33, wherein

said web comprises a porous material to permit infusion.

35. A method as claimed in claim 34, wherein said flowable material is coffee or tea.

36. A device for feeding a predetermined amount of flowable material into a container, said device comprising inlet means for receiving said flowable material, means defining at least one dosing chamber, means for driving said flowable material from said inlet means to the or each said dosing chamber, and reciprocating means movable through the or each said dosing chamber to drive a predetermined amount of said flowable material into said container.

37. A device as claimed in claim 36, comprising movable sleeve means arranged to define at least one selectively variable size inlet to the or each said dosing chamber.

38. A device as claimed in claim 36 or 37, wherein said driving means comprises at least one auger.

39. A device as claimed in claim 38, wherein the or each auger is servo driven.

40. A device as claimed in claim 37, 38 or 39, wherein said inlet means is arranged such that said flowable material is fed into said chamber in a direction transverse to the direction of movement of said reciprocating means.

41. A device as claimed in claim 37, 38 or 39, wherein said chamber defining means defines two said dosing chambers, said inlet defining means defines respective passages feeding to said dosing chambers and the arrangement is such that said chamber defining means is movable between a first position in which a first of said chambers is aligned with said reciprocating means and a second of said chambers is in a position to receive said flowable material from the respective said passage and a second position in which said second chamber is aligned with said

reciprocating means and said first chamber is in a position to receive said flowable material from the respective said passage.

42. A device as claimed in claim 41, wherein said chamber defining means comprises a plate which has respective through-holes defining said chambers, said plate being movable in translation between said first position and said second position.

43. A device as claimed in any one of claims 36 to 42, wherein said reciprocating means comprises an axially slidable plunger.

44. A device for feeding a predetermined amount of flowable material into a container, said device comprising means defining at least one outlet, means defining a plurality of dosing chambers, inlet means for receiving said flowable material, means for driving said flowable material from said inlet means to said dosing chambers, means for pushing said flowable material out of said dosing chambers to said outlet defining means and means for causing relative reciprocal movement between said outlet defining means and said chamber defining means, the arrangement being such that each said chamber can be positioned in alignment with said pushing means and said outlet means whilst the or at least one other chamber receives flowable material from said inlet means.

45. A device as claimed in claim 44, wherein said outlet defining means is fixed and said chamber defining means comprises a slidable plate having respective through-holes defining each said dosing chamber.

46. A device as claimed in claim 44 or 45, wherein said relative movement is translational movement.

47. A device as claimed in claim 44, 45 or 46, having two said dosing chambers and one said outlet.

48. A device as claimed in any one of claims 44 to 47, wherein said driving means is disposed in said inlet means.

49. A device as claimed in any one of claims 44 to 48, wherein said driving means comprises at least one auger.

50. A device as claimed in any one of claims 44 to 49, wherein said pushing means comprises as least one reciprocating plunger.

51. Apparatus as claimed in any one of claims 1 to 10 or 23 to 28, wherein said feeding means comprises a device as claimed in any one of claims 36 to 43 or 44 to 50.

52. Apparatus as claimed in any one of claims 1 to 10 or 23 to 28 or 51, wherein each said arm has a free end and said free ends coincide with respective lengthwise extending edges of said web.

Fig.1.

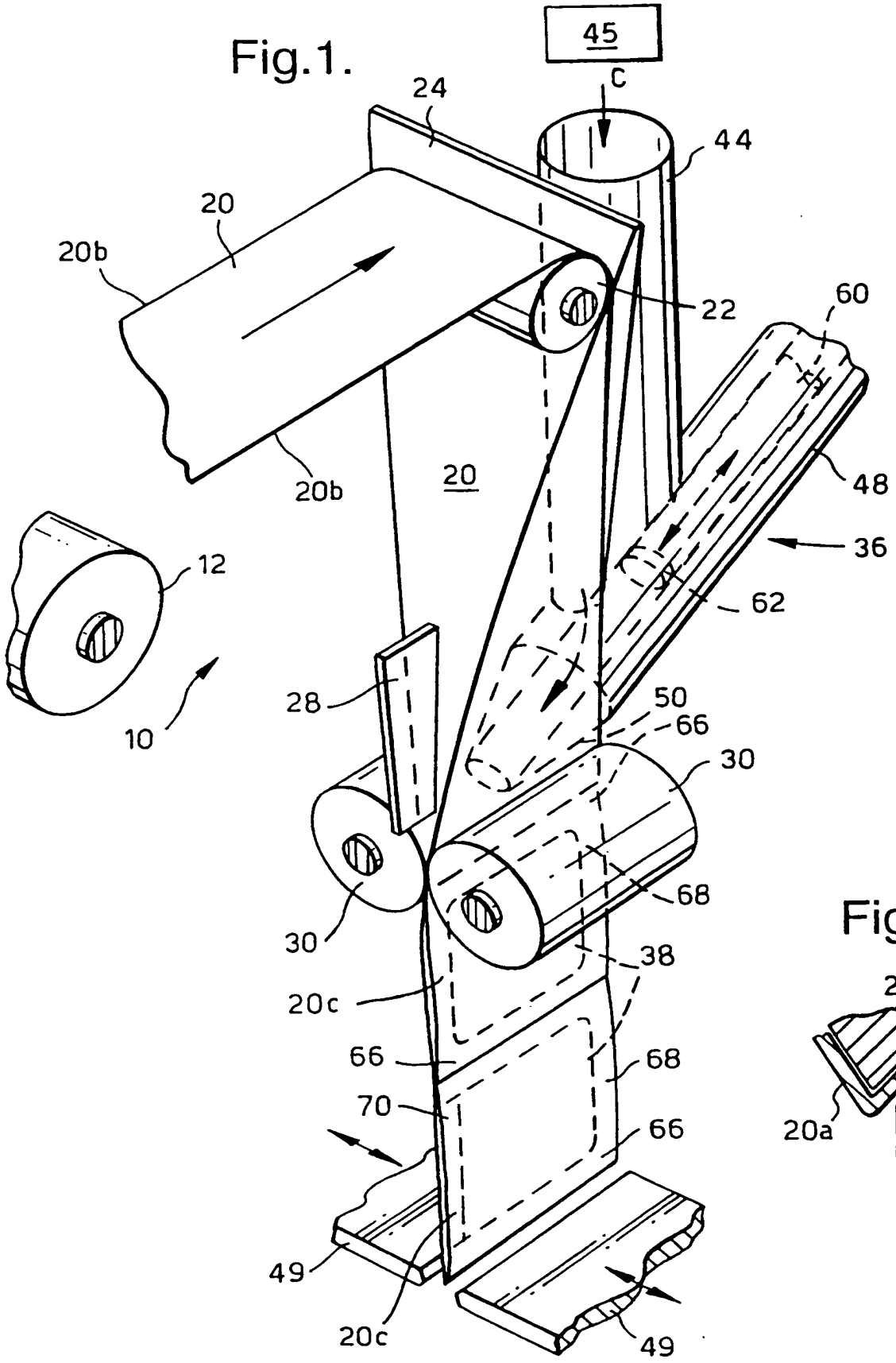

Fig.2.

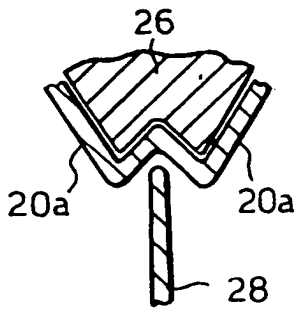

Fig.3.

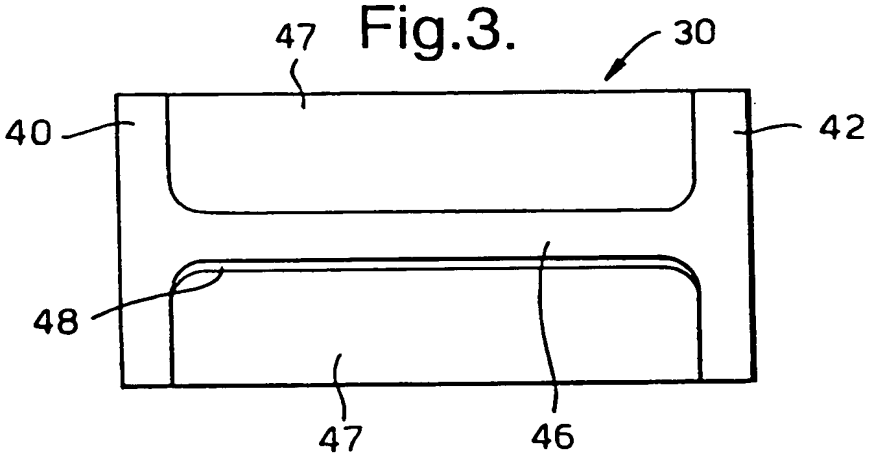

Fig.4.

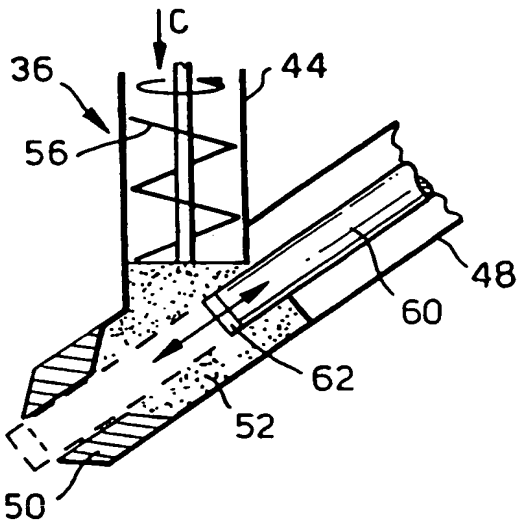

Fig.4 a.

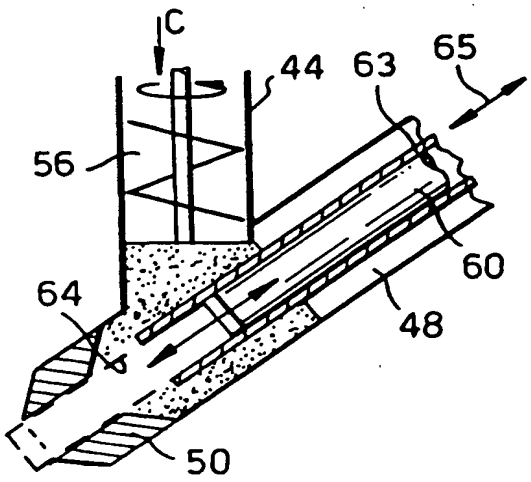

Fig.9.

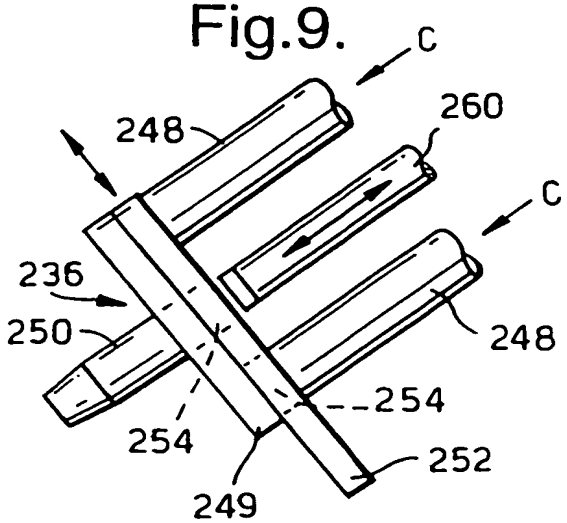

Fig.8.

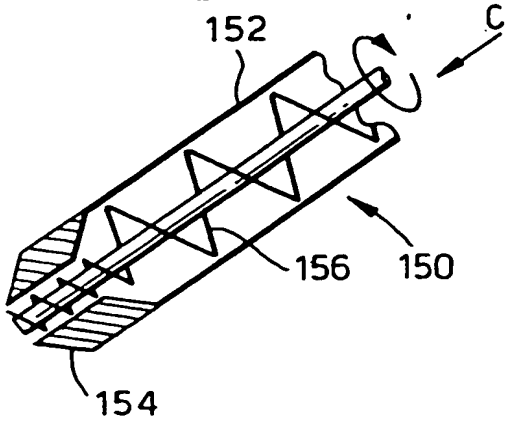

Fig.5.

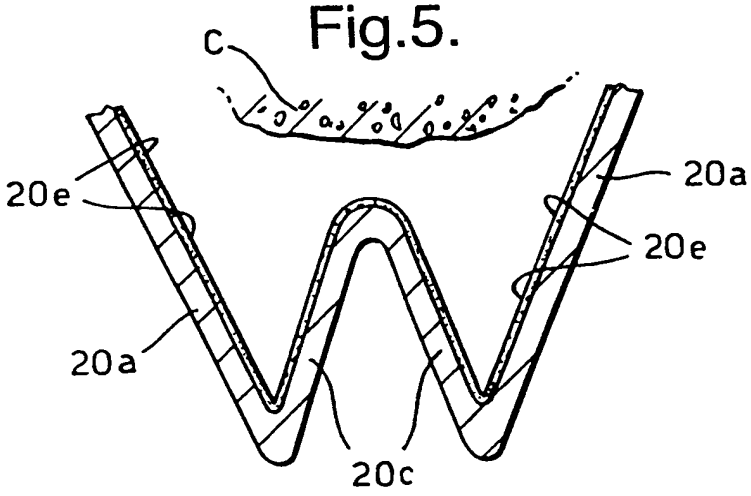

Fig.6.

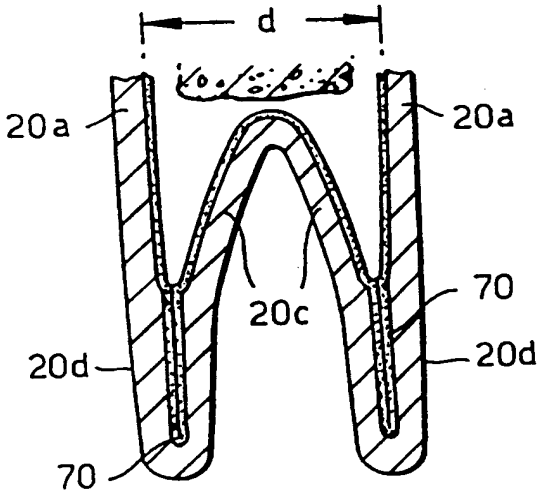

Fig.7.